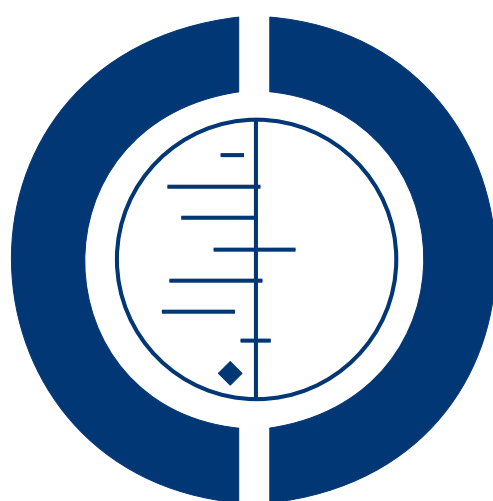


# **Surgical removal versus retention for the management of asymptomatic impacted wisdom teeth (Review)**

Mettes TG, Ghaeminia H, Nienhuijs MEL, Perry J, van der Sanden WJM, Plasschaert A



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[Intervention Review]

# Surgical removal versus retention for the management of asymptomatic impacted wisdom teeth

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## ABSTRACT

### Background

The prophylactic removal of asymptomatic impacted wisdom teeth is defined as the (surgical) removal of wisdom teeth in the absence of local disease. Impacted wisdom teeth may be associated with pathological changes, such as inflammation of the gums around the tooth, root resorption, gum and alveolar bone disease, damage to the adjacent teeth and the development of cysts and tumours. Other reasons to justify prophylactic removal have been to prevent late incisor crowding. When surgical removal is carried out in older patients, following the development of symptoms, the risk of postoperative complications, pain and discomfort increases. Nevertheless, in most developed countries prophylactic removal of trouble-free wisdom teeth, either impacted or fully erupted, has long been considered as 'appropriate care' and is a very common procedure. There is a need to determine whether there is evidence to support this practice.

### Objectives

To evaluate the effects of prophylactic removal of asymptomatic impacted wisdom teeth in adolescents and adults compared with the retention (conservative management) of these wisdom teeth.

### Search methods

The following electronic databases were searched: the Cochrane Oral Health Group's Trials Register (to 30 March 2012), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2012, Issue 1), MEDLINE via OVID (1950 to 30 March 2012), and EMBASE via OVID (1980 to 30 March 2012). There were no restrictions on language or date of publication.

### Selection criteria

All randomised controlled trials (RCTs) on adolescents and adults comparing the effect of prophylactic removal of asymptomatic impacted wisdom teeth with no-treatment (retention).

## **Data collection and analysis**

Six review authors screened the results of the search and assessed whether trials met the inclusion criteria for the review. Data extraction and risk of bias assessment were conducted in duplicate and independently by six review authors. Where information was unclear, authors of studies were contacted for additional information.

## **Main results**

No RCTs were identified that compared the removal of asymptomatic wisdom teeth with retention and reported quality of life. One RCT on adolescents was identified that compared the removal of impacted mandibular wisdom teeth with retention and only examined the effect on late lower incisor crowding. This study at high risk of bias provided no evidence that extraction of wisdom teeth had an effect on lower incisor crowding over 5 years.

## **Authors' conclusions**

Insufficient evidence was found to support or refute routine prophylactic removal of asymptomatic impacted wisdom teeth in adults. A single trial comparing removal versus retention found no evidence of a difference on late lower incisor crowding at 5 years, however no other relevant outcomes were measured.

Watchful monitoring of asymptomatic third molar teeth may be a more prudent strategy.

## **PLAIN LANGUAGE SUMMARY**

### **Surgical removal versus retention for the management of asymptomatic impacted wisdom teeth**

Wisdom teeth, or third molars, generally erupt into the mouth between the ages of 17 to 24 years. These are normally the last teeth to erupt and mostly into a position closely behind the last standing teeth (second molars). Space for these teeth to erupt can be limited and more than other teeth, wisdom teeth often fail to erupt or erupt only partially. Failure of the third molars to fully erupt is often due to impaction of the wisdom teeth against the second molars (teeth directly in front of the wisdom teeth). This occurs when the second molars are blocking the path of eruption of the third molar teeth and act as a physical barrier preventing further eruption. An impacted wisdom tooth is called asymptomatic if the patient does not experience signs or symptoms of pain or discomfort associated with this tooth.

Impacted wisdom teeth may be associated with pathological changes, such as swelling and ulceration of the gums around the wisdom teeth, damage to the roots of the second molars, decay in the second molars, gum and bone disease around the second molars and the development of cysts or tumours. General agreement exists that removal of wisdom teeth is appropriate if symptoms of pain or pathological conditions related to the wisdom teeth are present. This review found no evidence to support or refute routine prophylactic removal of asymptomatic impacted wisdom teeth in adults. The only included trial provided no evidence that removal of impacted wisdom teeth has an effect on late crowding of front teeth.

## SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [\[Explanation\]](#)

Extraction compared with retention for asymptomatic wisdom teeth						
<b>Patient or population:</b> Adolescents and adults with impacted asymptomatic wisdom teeth <b>Settings:</b> General dental practice <b>Intervention:</b> Extraction <b>Comparison:</b> Retention						
Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk					
	Corresponding risk					
	Retention	Extraction				
Quality of life after at least 5 years follow-up	Risk in population**			No RCTs <sup>1</sup>		
*The basis for the <b>assumed risk</b> (e.g. the median control group risk across studies) is provided in footnotes. The <b>corresponding risk</b> (and its 95% confidence interval) is based on the assumed risk in the comparison group and the <b>relative effect</b> of the intervention (and its 95% CI).						
** Incomplete information on the risk of adverse outcomes following retention of impacted wisdom teeth						

<sup>1</sup>There was only one study which looked at one small aspect of the quality of life measure: crowding of lower teeth. This study, at high risk of bias, showed inconsistent effect on crowding.

## BACKGROUND

### Description of the condition

Wisdom teeth, or third molars, generally erupt into the mouth between the ages of 17 and 24 years (Garcia 1989; Hugoson 1988). More than other teeth, wisdom teeth often fail to erupt or erupt only partially (Hugoson 1988). Impaction occurs where complete eruption into a normal functional position is prevented and completion of the root growth is fully established. This can be due to lack of space (in the mouth), obstruction by another tooth, or development in an abnormal position (Venta 1999). A tooth that is completely impacted can be entirely covered by soft tissue or covered partially by bone and soft tissue, or completely covered by bone. Partial eruption occurs when the tooth is visible in the dental arch of the lower jaw but has not erupted into a normal functional position (RCS Eng 1997). An impacted wisdom tooth is called trouble-free if the patient does not experience signs or symptoms of pain or discomfort associated with it (Song 1997). The literature also uses the terms 'disease-free' and 'asymptomatic' (Shepherd 1993).

The prevalence of asymptomatic impacted third molars varies widely and is influenced by age, gender and ethnicity (Bradley 1996). Impaction of wisdom teeth in the lower jaw is more common than in the upper jaw (Hugoson 1988). Most of the difficulties following surgical removal, such as postoperative morbidity, pain, discomfort and restricted activity, are related to lower wisdom teeth (Bienstock 2011; SIGN 1999).

Whenever impacted wisdom teeth cause symptoms of pain or pathological changes, such as swelling or ulceration of the gums, the tooth is no longer trouble-free. General agreement exists that removal is then an appropriate treatment decision (Guralnick 1980).

A reason sometimes given for the removal of asymptomatic third molars may be to prevent crowding of the front teeth (incisors) in the future (Kandasamy 2009). Late incisor crowding, following orthodontic treatment undertaken during adolescence, may be seen as a risk associated with leaving asymptomatic third molars in place.

### Description of the intervention

The prophylactic removal of asymptomatic impacted wisdom teeth is defined as the (surgical) removal of wisdom teeth in the absence of local disease. The removal of impacted third molars is the most common surgical procedure in dentistry, and consequently the associated costs are significant (Shepherd 1994). As with any surgical procedure, extraction of impacted third molars is associated with some risk of adverse effects. Short term adverse effects of third molar extraction surgery include temporary nerve damage, postoperative complications such as alveolar osteitis (dry socket), infection, secondary haemorrhage, pain, swelling, trismus

(restricted mouth opening). Long term adverse effects of third molar surgery are uncommon and may include permanent nerve damage (up to 1%), damage to adjacent teeth or very rarely mandibular fracture (Kandasamy 2009). There is a belief, shared by many dentists and their patients that prophylactic removal of asymptomatic wisdom teeth is justified in order to avoid future problems and complications associated with these teeth, which may be both more difficult and more costly to treat in older patients (Kandasamy 2009).

Retention of asymptomatic impacted wisdom teeth is defined as monitoring the status of the wisdom teeth. This approach to the management of asymptomatic wisdom teeth requires that individuals have regular dental checkups to ensure the early detection of any symptoms associated with third molars, so that appropriate treatment can be provided.

### How the intervention might work

Impacted wisdom teeth have been associated with pathological changes, such as inflammation of the gums around the tooth (pericoronitis), root resorption, gums and alveolar bone disease like gingivitis and periodontal disease, damage of the adjacent teeth, and the development of cysts or tumours. Several other reasons to justify prophylactic removal have been given i.e. wisdom teeth do not always fulfil a functional role in the mouth and when surgical removal is carried out on older patients the risk of more postoperative complications, pain and discomfort increases (Brokaw 1991; Chuang 2007; Mercier 1992; Stavisky 1989; Tate 1994). In most Western countries the prophylactic removal of asymptomatic third molars, either impacted or fully erupted, has long been considered as 'appropriate care' (Brokaw 1991; Tate 1994). However, prophylactic removal of asymptomatic wisdom teeth may lead to considerable postoperative complications such as altered sensation/numbness, difficulties in eating and speaking, (par)esthesia of the tongue and the lip and infection of bone or surrounding tissues or both (Mercier 1992).

The low frequency of pathological changes related to impacted wisdom teeth has been used to promote a more cautious approach (Shepherd 1993; Stephens 1989). Health risks and cost-effectiveness of the prophylactic removal of asymptomatic impacted wisdom teeth should play a more prominent role in the decision-making process (Edwards 1999). Moreover, as the costs of surgical removal are significant (Tulloch 1987), removal of asymptomatic impacted wisdom teeth that may remain disease-free indefinitely, produces an unnecessary burden on healthcare resources (NICE 2000).

### Why it is important to do this review

There is a large variation among general dental practitioners in their management of asymptomatic impacted lower wisdom teeth

(Knutsson 1992). There are both economic and personal costs associated with the removal of asymptomatic wisdom teeth. Prudent decision-making, with adherence to specified indicators for removal, may reduce the number of surgical procedures by 60% or more (Shepherd 1993). It has been suggested that watchful monitoring of asymptomatic wisdom teeth may be an appropriate strategy (Song 2000). The decision-making process, regarding retention versus the prophylactic removal of asymptomatic impacted wisdom teeth in the lower jaw, should be based on the best available evidence and combined with clinical experience. The key element of judgment in cases of prophylactic surgical intervention should be a patient safety risk-benefit analysis to avoid substantial iatrogenic injuries. In addition, patients' perspectives, values and attitudes should play a prominent role (Bradley 1996).

## OBJECTIVES

To evaluate the effects of prophylactic removal of asymptomatic impacted wisdom teeth in adolescents and adults compared with the retention (conservative management) of these wisdom teeth.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

All randomised controlled clinical trials (RCTs) comparing the effect of prophylactic removal of asymptomatic impacted wisdom teeth to non-intervention (retention).

#### Types of participants

Participants in the studies to be reviewed are individuals (males and females of all ages) with asymptomatic impacted wisdom teeth. Asymptomatic is defined as the absence of either clinical symptoms such as pain or swelling, as well as the absence of any radiographic indication of early pathology.

#### Types of interventions

Trials comparing planned prophylactic removal of wisdom teeth with retention of asymptomatic impacted wisdom teeth (conservative management). The control group (monitoring) are likely to continue to receive routine oral examinations and will undergo wisdom tooth removal if and when symptoms (pain/swelling) or pathological changes are evident.

### Types of outcome measures

#### Primary outcomes

Health related quality of life measures associated with retention or removal included.

#### Pathological changes associated with retention

- Pericoronitis (inflammation of the gum around the crown of a tooth).
- Caries (tooth decay).
- Cysts.
- Tumours.
- Root resorption.
- Dimensional changes in the dental arch (crowding).

#### Symptoms associated with removal of wisdom teeth

- Pain/swelling/trismus.
- Alveolar osteitis.
- Nerve damage.

#### Costs

- Costs associated with treating symptoms associated with retention.
- Direct costs associated with the removal of wisdom teeth and treating any associated symptoms.
- Days off work or study.

### Search methods for identification of studies

#### Electronic searches

For the identification of studies included in, or considered for this review, detailed search strategies were developed for each database searched. These were based on the search strategy developed for MEDLINE (OVID), but revised appropriately for each database. The search strategy used a combination of controlled vocabulary and free text terms and was run with the Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomised trials (RCTs) in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of the *Cochrane Handbook for Systematic Reviews of Interventions* version 5.1.0 (Higgins 2011). Details of the MEDLINE search are provided in [Appendix 1](#).

The following databases were searched:

- The Cochrane Oral Health Group's Trials Register (to 30 March 2012) ([Appendix 2](#))
- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2012, Issue 1) ([Appendix 3](#))
- MEDLINE via OVID (1950 to 30 March 2012) ([Appendix 1](#))

- EMBASE via OVID (1980 to 30 March 2012) ([Appendix 4](#)).

### Searching other resources

Handsearching was done as part of the Cochrane Worldwide Handsearching Programme (*see* The Cochrane Collaboration's [Master List](#) of journals which are being handsearched). Personal references were also searched.

## Data collection and analysis

### Selection of studies

Six authors (Dirk Mettes (DM), Marloes Nienhuijs (MN), Wil van der Sanden (WvdS), Hossein Ghaemini (HG), John Perry (JP), and Alphons Plasschaert (AP)) in duplicate, independently and in a non-blinded fashion, assessed the title, keywords, abstracts and/or the materials and methods section of results identified by the search strategy. Relevant articles identified by reference searching were obtained.

All articles selected by the authors were obtained. The articles on which the authors disagreed were read in full and a decision to include or exclude was made upon discussion. Persisting disagreement did not occur. The criteria for inclusion were: study design (RCT), random allocation, comparison of prophylactic removal versus retention, and data on at least one of the selected clinical outcomes as a part of the primary outcome measure: Quality Adjusted Life Years (health effects on adolescents and adults, economical effects and cost-effectiveness).

### Data extraction and management

The relevant data were extracted from the included study independently by three authors (DM, MN, WvdS). The following types of data were recorded: year of the publication, date and duration of the study, age of the participants, sample size, numbers of participants randomised to each group, and data on cost-effectiveness. Comparability of participants, interventions and outcomes at baseline were recorded.

The results were discussed between authors until agreement was obtained. In case of uncertainty the authors would have been contacted for clarification. Should this uncertainty still persist, the data were not used in the review.

### Assessment of risk of bias in included studies

Assessment of the risk of bias in the included studies was undertaken independently and in duplicate by three review authors. Disagreements were resolved by discussion. It was carried out using The Cochrane Collaboration's tool for assessing risk of bias and a 'Risk of bias' table was compared for each study as outlined

in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* 5.1.0 ([Higgins 2011](#)).

The following domains were assessed as 'low risk' of bias, 'high risk' of bias, or 'unclear risk' of bias:

1. Sequence generation
2. Allocation concealment
3. Blinding (of participants, personnel and outcome assessors)
4. Incomplete outcome data addressed
5. Free of selective outcome reporting.

Further quality assessment was carried out to assess the randomisation procedure, sample size calculations, the definition of exclusion/inclusion criteria, adequate definition of success criteria and comparability of control and treatment groups at the start of the trial. The study authors were contacted to seek clarification when there was uncertainty over the data. These assessments are reported for each individual study in the 'Risk of bias' table under the 'Characteristics of included studies'.

A summary assessment of the risk of bias for the primary outcome (across domains) across studies was undertaken ([Higgins 2011](#)). Within a study, a summary assessment of low risk of bias is given when there is a low risk of bias for all key domains, unclear risk of bias when there is an unclear risk of bias for one or more key domains, and high risk of bias when there is a high risk of bias for one or more key domains. Across studies, a summary assessment is rated as low risk of bias when most information is from studies at low risk of bias, unclear risk of bias when most information is from studies at low or unclear risk of bias, and high risk of bias when the majority of information is from studies at high risk of bias sufficient to affect the interpretation of the results.

### Measures of treatment effect

For dichotomous outcomes, we planned to express the estimate of treatment effect of an intervention as risk ratios (RR) (symptom present or not) together with 95% confidence intervals (CIs). For continuous outcomes (such as mean VAS scores for pain), we planned to use mean differences and standard deviations to summarise the data for each trial.

### Assessment of heterogeneity

Assessment of heterogeneity in quantifying inconsistency across studies would have been carried out using the  $I^2$  statistic as described in section 9.5.2 of the *Cochrane Handbook for Systematic Reviews of Interventions*.

### Data synthesis

It was planned to conduct a meta-analysis if there were sufficient studies reporting the same outcome measures. We planned to combine risk ratios and calculate 95% confidence intervals for dichotomous data and mean differences with 95% confidence intervals for continuous data. We planned to use fixed-effect models unless



more than three studies were included in each meta-analysis, or there was clinical heterogeneity amongst the studies.

### **Sensitivity analysis**

It was planned to undertake sensitivity analyses to examine the effect of randomisation, allocation concealment and blinded outcome assessment on the overall estimates of effect.

## **RESULTS**

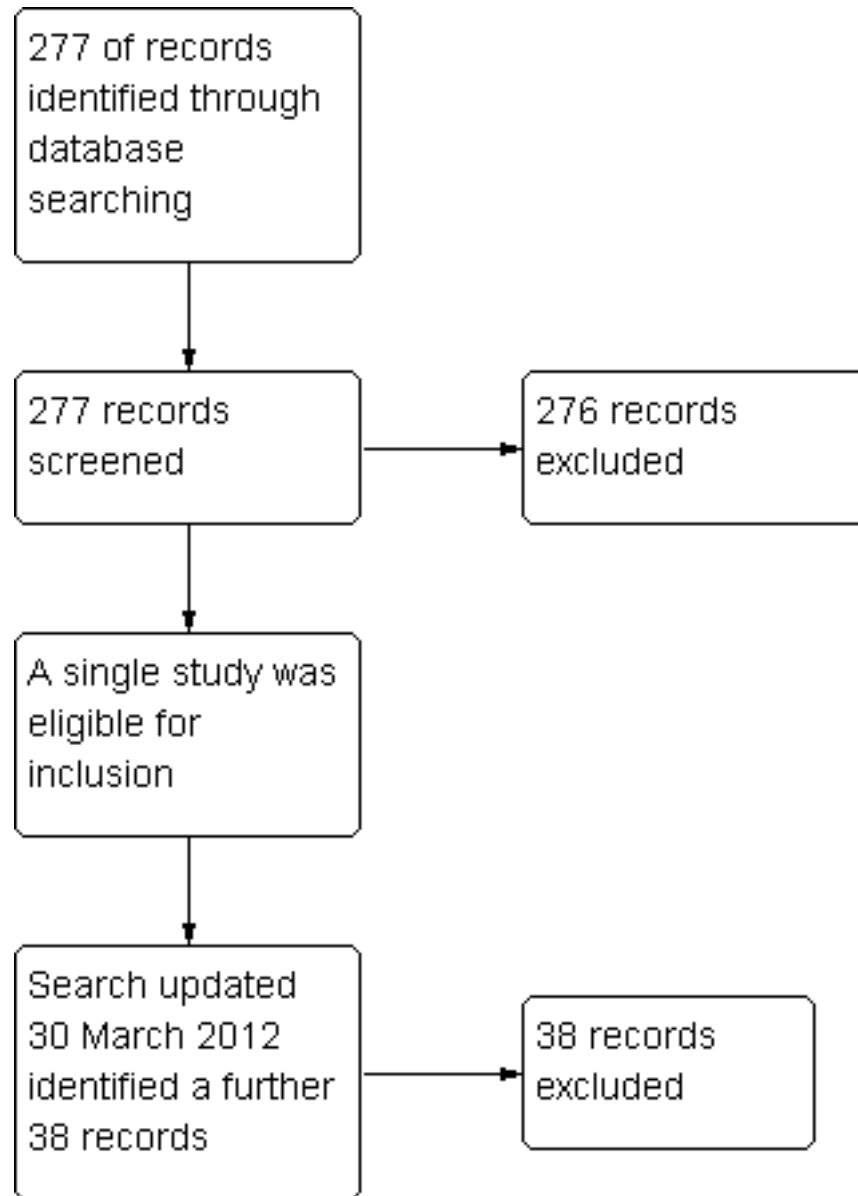
### **Description of studies**

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

### **Results of the search**

The electronic searches (March 2012) of the review update identified a total of 277 references and all review authors independently screened these titles and abstracts. From these, no additional reports of trials were eligible according to the defined inclusion criteria for this review with regard to study design, participants, and interventions. See [Figure 1](#) for study flow diagram of the search update.

Figure 1. Review flow diagram.



## Included studies

### Characteristics of the trial setting and investigators

The included trial, [Harradine 1998](#), was conducted in the United Kingdom, using a parallel group design.

### Characteristics of the interventions

The treatment intervention used in the trial was the surgical prophylactic removal of asymptomatic impacted third molar.

### Characteristics of outcome measures

[Harradine 1998](#)

(1) Little's irregularity index (LII), defined as the sum of the contact point displacements from anatomic contact point to contact point.

(2) Inter canine width (ICW), defined as anatomical distal contact points of the lower canines.

(3) Arch length (AL), defined as the sum of the distances from the mesial contact of the first molar to the midline contact point of the first lower incisor.

These measurements were registered at baseline and follow-up. Mean differences with standard deviations and 95% confidence intervals between two time-points were calculated.

Length of follow-up: 5 years, mean length of follow-up was 66 +/- 12.6 months.

## Sample size calculation

The included trial reported no a priori sample size calculation.

## Inclusion and exclusion criteria

The identified trial, [Harradine 1998](#), used well described inclusion criteria, and included adolescents (mean age 14 years and 10 months, standard deviation (SD): 16.2 months) who had previously undergone orthodontic treatment. Treatment comprised of active treatment only in the upper jaw and with no treatment or premolar extractions only being carried out in the lower jaw. All participants (n = 164; 55% female) had 'crowded' third molars, that is third molars whose long axis and presumed path of eruption was through the adjacent second molar.

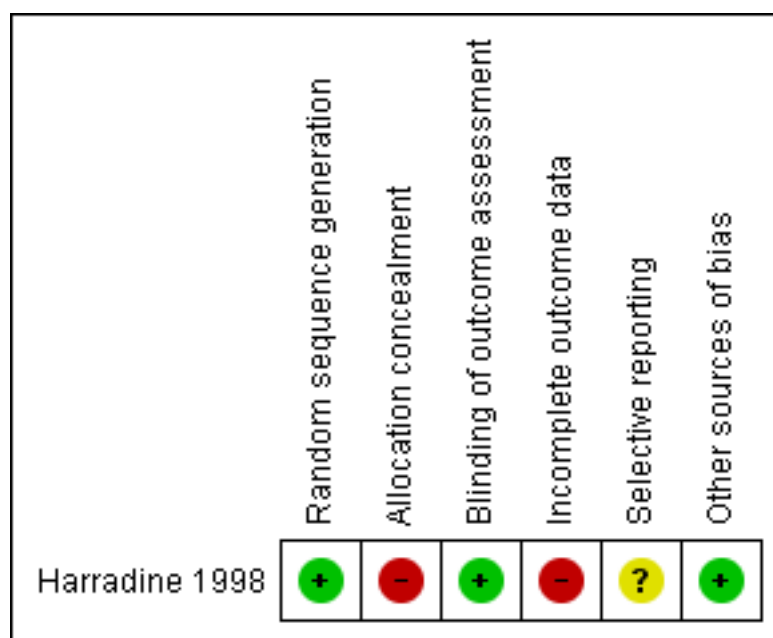
## Excluded studies

The included Lindqvist study ([Lindqvist 1982](#)) in the original published version was excluded in the updated review, because we think that a split-mouth study is not an appropriate design to assess crowding. The ongoing van der Waal study (1999) in the original published version of this review could not be further assessed and therefore is not listed in this review. The trial stopped early and despite several attempts to contact the investigators no details of the study design or outcome data were available.

## Risk of bias in included studies

See [Characteristics of included studies](#) table and [Figure 2](#).

**Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.**



### Allocation

In the assessed trial (Harradine 1998) a list of randomly generated numbers was used and qualified as adequate. The method of allocation concealment was not explicitly described which gave rise to selection bias of the results.

### Blinding

In the included trial it was impossible for participants and operators to be blinded to the intervention, however the outcome assessor was blinded.

### Incomplete outcome data

In the Harradine trial 53% of the original patients were lost to follow-up at 5 years. The reasons given for this loss were that researchers were unable to contact these participants at the addresses given. Trial authors reported the results of digitised modelling of the initial casts of 44 of the 87 non-responders. It is not stated how these 44 were selected. The trial authors used three measurements to compare the casts from non-responders with the initial casts from those who were included in the 5 year follow-up, and they determined that there was no difference between these groups.

More participants were lost from the conservative management group (49/82 = 60%) compared to the extraction group (38/82 = 46%) although the reasons given are unable to be contacted. There

are no data for each treatment group on the gender balance of those who completed compared to those who did not. We assessed this trial to be at high risk of attrition bias which could have affected the overall results.

### Selective reporting

The only outcomes reported in the paper are orthodontic indices. Adverse events and/or complications of the treatments were not reported. The risk of reporting bias is assessed as unclear.

### Other potential sources of bias

Gender, age and orthodontic conditions (impacted molars, orthodontic treatment) were mentioned, but not described for each treatment group. There is very little information about the comparability of groups at study entry, and at the 5 year follow-up.

### Effects of interventions

See: [Summary of findings for the main comparison](#)

There was only one trial which met the inclusion criteria for this review. Harradine 1998 had the primary outcome of lower incisor crowding. This trial did not report any information concerning the outcomes of pericoronitis, caries, cysts, tumours or root resorption in participants whose wisdom teeth were retained, nor

pain, swelling, trismus, or the incidence of alveolar osteitis or nerve damage in those undergoing prophylactic extraction.

The primary outcome of this study was late lower incisor crowding which was determined from digitised measurements of casts taken 5 years after randomisation. Less than half of the participants initially randomised were able to be contacted for this follow-up, and 44 and 33 participants were evaluated in the extraction and non-extraction groups respectively (54% and 40% of those originally randomised). The trial reports changes in three measures of crowding over 5 years of follow-up (Little's irregularity index, intercanine width and arch length).

Outcomes after 5 years	Extraction group (n = 44)	Non-extraction group (n = 33)	Mean difference (95% confidence interval)
Mean change in Little's irregularity index (SD*)	0.80 (1.23)	1.10 (2.72)	0.30 (-1.30 to 0.70), P = 0.56
Mean mm change in intercanine width (SD)	-0.37 (0.73)	-0.38 (0.85)	0.01 (-0.35 to 0.37), P = 0.92
Mean mm change in arch Length (SD)	-1.1 (1.13)	-2.13 (0.97)	1.03 (0.56 to 1.50), P < 0.001

\*SD = standard deviation

There was no statistically significant difference between the groups for the outcomes of Little's irregularity index or intercanine width. There was a statistically significant, small difference of 1.03 mm (0.56 to 1.50), P < 0.001 between the groups in arch length. These findings appear to be inconsistent with each other. The authors conducted some post hoc analysis and state that a partial explanation lies in the fact that some of the participants had undergone lower premolar extractions and still had some space not fully closed at study entry. There is no evidence from this single study at high risk of bias that extraction of asymptomatic third molars influences lower incisor crowding after 5 years.

## DISCUSSION

### Summary of main results

No randomised controlled trials were identified to evaluate whether prophylactic removal of asymptomatic wisdom teeth prevents painful and/or infection complications arising from the retention of these teeth. This review identified a single study that compared extraction of asymptomatic wisdom teeth with retention and only evaluated the effect on crowding after 5 years follow-up. Three measures of crowding were taken and the results were

inconsistent. There is no evidence from this single study at high risk of bias that extraction of asymptomatic wisdom tooth has an effect on lower incisor crowding.

### Overall completeness and applicability of evidence

A single randomised controlled trial was identified which compared extraction of asymptomatic wisdom teeth with retention of these teeth. The trial had the primary outcome of late lower incisor crowding. Risk of bias was assessed as high due to the absence of allocation concealment and the high and differential attrition rate in each group. This trial did not provide any information on the potential harms of wisdom tooth extraction.

The trial intervention focused on participants who had completed orthodontic treatment i.e. a selected group not representative of the general population with asymptomatic impacted wisdom teeth. It is interesting to note the high rate of attrition in this study, which is due to the researchers being unable to make contact with the participants 5 years after recruitment. Loss to follow-up is likely to be a major obstacle in obtaining data about the effects of prophylactic extraction of asymptomatic wisdom teeth compared to retention as participants in such trials are likely to be recruited towards the end of their high school years. In the

years following recruitment participants are likely to be difficult to contact as they move to higher education, go travelling or change locations seeking employment.

There is no information from this trial concerning costs. Costs may be borne by the patient, the patient's parents or by the publicly funded healthcare system. As well as the financial cost of the procedure there is a personal cost in terms of pain and suffering and loss of time from work or studying.

There is also no information from this trial about adverse effects, either of the prophylactic removal (temporary or permanent nerve damage, dry socket, infection, mandibular fracture) or about any other adverse effects associated with retention of these teeth such as pain, inflammation or infection.

Furthermore the only trial identified, did not shed any light on patients' perspectives or on cost issues. Research in preferences of patients on these aspects is strongly advocated. As long as further reliable research is lacking, preventive surgical removal of asymptomatic impacted third molars to prevent potential lower incisor crowding cannot be justified on current evidence.

### Quality of the evidence

The only trial included in this review was at high risk of bias. There is a need for further adequately powered trials with long follow-up (10 years minimum) to answer the question of whether prophylactic removal of asymptomatic wisdom teeth is justified. However, as previously noted, individuals recruited into a trial in their late teens are likely to be difficult to follow up as this life stage is associated with high mobility.

We chose a quality of life outcome in order to capture the different benefits and harms associated with prophylactic extraction and retention of asymptomatic wisdom teeth. The reason we chose this type of outcome measure is due to the difficulties of comparing the various outcomes, i.e. the rate of complications after surgical removal versus the incidence of pathological change in case of retention and the rate of complications due to delayed surgical removal (Song 2000). Recently, data emerged concerning the validation of the Oral Health Impact Profile (OHIP-14) showing that OHIP-14 is a valid and reliable measure of oral health related quality of life in general dental practice and is responsive to impacted third molar clinical change (Fernandes 2006). Using quality of life outcome measures is a relatively new research topic in dentistry. However, the only included study focused on a single outcome - lower incisor crowding.

### Agreements and disagreements with other studies or reviews

The Scottish Intercollegiate Guideline Network published guidelines for the management of unerupted and impacted third molars in 1999 (SIGN 1999) and The National Institute for Health and Clinical Excellence published their guidelines for the removal of third molars in 2000 (NICE 2000). Both concluded that based

on the costs and risks there was no valid evidence to support the prophylactic removal of asymptomatic wisdom teeth.

In the late 1990s the American Association of Oral and Maxillofacial Surgeons acknowledged the absence of evidence to answer this question and pledged significant amount of money for a multicentre trial (Kandasamy 2009). This group "leans more towards the removal of asymptomatic third molars on the basis they are a potential source of chronic inflammation" (Kandasamy 2009). The progress report on the "Third Molar Clinical Trials" (White 2007) noted that the length of a trial (minimum 7 years) required to produce meaningful data made the effort "almost prohibitive". We have not been able to find a randomised controlled trial amongst this research. More than 70 papers have been published as a result of these studies, including a large cohort study which documents the incidence of adverse effects following more than 8000 third molar extractions in patients at least 25 years old (Haug 2005). There have also been large studies documenting the incidence of complications associated with the retention of symptomatic wisdom teeth, and attempting to identify the risk factors associated with poor outcomes following either extraction or retention. There are issues of selection bias and confounding in all these studies.

There is still an ongoing disagreement regarding to the prophylactic removal of asymptomatic impacted wisdom teeth. The debate yields controversial statements (Flick 1999). The key question in the debate remains: why should impacted wisdom teeth be removed in the absence of symptoms or pathological conditions? If we had the ability to reliably predict future development, prophylactic removal would perhaps be unnecessary (Venta 2000). However, reliable estimates of the onset of pathology related to non-intervention for impacted third molars are unavailable (Venta 2004), in large part due to the widespread practice of routine removal over the past decades. The limited information on the prevalence of pathology related to third molars in older patients suggests that the prophylactic removal of all impacted third molars before adulthood may not be justified. Non-intervention outcome studies are rare due to the problems associated with a complex long-term prospective study design (van der Sanden 2002). Another attempt has been made by using actuarial life time tables to shed some light on the natural history of asymptomatic impacted lower wisdom teeth, but longer follow-up periods are required to get more solid data (Fernandes 2010).

The decision about whether to recommend extraction or retention of asymptomatic wisdom teeth may also be influenced by factors such as cost (whether extraction cost is covered by public funding, insurance or is borne by the patient), possible professional liability.

## AUTHORS' CONCLUSIONS

## Implications for practice

There is no evidence from randomised controlled trials (RCTs), that prophylactic removal of asymptomatic wisdom teeth prevents painful and/or infection complications arising from the retention of these teeth. A single RCT addressing the outcome of late lower incisor crowding shows no evidence of a difference due to either removal or retention of third molars. General dental practitioners (GDPs) and oral and maxillofacial surgeons can only rely on clinical experience and patient values and preferences, in order to make decisions concerning the treatment of individuals in their care.

## Implications for research

There still is a need for long-term and well-designed prospective

randomised controlled trials of prophylactic extraction versus retention of asymptomatic impacted third molars. To solve the problem of comparability an overall oral health related quality of life outcome measure is advocated. However, it is acknowledged that there are significant difficulties in conducting long duration trials in young adults who are both busy and mobile.

## ACKNOWLEDGEMENTS

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377–83.

\* *Indicates the major publication for the study*

## CHARACTERISTICS OF STUDIES

### Characteristics of included studies [ordered by study ID]

#### Harradine 1998

Methods	Parallel group design - Two treatment groups. Location: Bristol UK. Single centre. Research aim: To investigate prospectively the effects of early extraction of third molars on late lower incisor crowding	
Participants	Inclusion criteria: Individuals who had previously undergone orthodontic treatment, but were no longer wearing orthodontic appliances or retainers. Orthodontic treatment comprised active treatment in the upper arch only with either removable appliances or a single arch fixed appliance, with no treatment or premolar extractions only being carried out in the lower arch. Individuals with crowded molars (third molars whose long axis and, therefore, presumed path of eruption was through the adjacent second molar) Exclusion criteria: Residual premolar extraction space. Number randomised:164 individuals (55% were female). Number evaluated after 5 years: 77 individuals completed the trial (58% were female). Age of entry to the trial (mean+/- standard deviation (SD)): 14 years 10 months +/- 16.2 months. Baseline characteristics: Reported for overall group sample, not per study group	
Interventions	Group I: Extraction of third molars (n = 44 evaluated). Group II: Retention of third molars (n = 33 evaluated).	
Outcomes	Outcome measures: (1) Little’s irregularity index (LII). Mean differences +/- SD for change. (2) Inter canine width (ICW). Mean differences +/- SD for change. (3) Arch length (AL). Mean differences +/- SD for change. Length of follow-up: 5 years, mean length of follow-up was 66 +/-12.6 months. For the upper arch no statistical differences were found between the two groups for the three outcome variables	
Notes	Sample size calculation: Not described. Analysis (linear modelling) of the measurements of the casts demonstrated no systematic differences between individuals who completed the trial and those who were lost to follow-up. Baseline characteristics per study group for comparability at entry would have been appropriate	
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation	Low risk	Quote: “..a list of randomly generated numbers was used to allocate..” Comment: Probably done.
Allocation concealment	High risk	Quote: “..a list of randomly generated numbers was used to allocate..”

**Harradine 1998** (Continued)

		Comment: The method of concealment is not fully described, it is likely that selection bias could affect the outcome of the study
Blinding of outcome assessment	Low risk	Quote: "the third molar status was unknown to the digitizer in order to eliminate sub-conscious bias" Comment: Probably done.
Incomplete outcome data	High risk	Quote: "...no systematic differences existed between those patients who entered the trial and completed, and those who entered and did not complete" Comment: 53% attrition overall, evaluation on 44 and 33 participants in extraction and non-extraction groups (54% and 40% respectively) and the reasons for non-completion are given as "loss of contact with occupiers of their previous address". There are no data on the gender balance of those who completed compared to those who did not, for each treatment group. Trial authors report only the results of modelling of 44 of the non-responders. This trial would seem to be at high risk of attrition bias
Selective reporting	Unclear risk	Comment: The only outcomes reported in the paper are orthodontic indices. There are no adverse effects of the treatments or symptoms reported
Other sources of bias	Low risk	Comment: More specified characteristics per study group for comparability at entry would have been appropriate

**Characteristics of excluded studies** [ordered by study ID]

Study	Reason for exclusion
Lindqvist 1982	Split-mouth study which is an inappropriate design to evaluate crowding of teeth

## DATA AND ANALYSES

This review has no analyses.

## APPENDICES

### Appendix 1. MEDLINE via OVID search strategy

1. Molar, Third/
2. ("third molar\*" or "wisdom tooth" or "wisdom teeth" or "3rd molar\*" or third-molar).mp.
3. Tooth, impacted/
4. ((tooth adj5 impact\$) or (teeth adj5 impact\$)).mp.
5. Tooth, unerupted/
6. unerupt\$.mp.
7. 1 or 2
8. 3 or 4 or 5 or 6
9. 7 and 8
10. Tooth extraction/
11. (extract\$ or remov\$).mp.
12. asymptom\$.mp.
13. (symptomless or symptom-free or "symptom free").mp.
14. (trouble-free or "trouble free").mp.
15. or/10-14
16. 9 and 15

The above subject search was linked to the Cochrane Highly Sensitive Search Strategy (CHSSS) for identifying randomised trials in MEDLINE: sensitivity maximising version (2008 revision) as referenced in Chapter 6.4.11.1 and detailed in box 6.4.c of the *Cochrane Handbook for Systematic Reviews of Interventions* version 5.1.0 (updated March 2011).

1. randomized controlled trial.pt.
2. controlled clinical trial.pt.
3. randomized.ab.
4. placebo.ab.
5. drug therapy.fs.
6. randomly.ab.
7. trial.ab.
8. groups.ab.
9. or/1-8
10. exp animals/ not humans.sh.
11. 9 not 10

### Appendix 2. The Cochrane Oral Health Group's Trials Register search strategy

((("third molar\*" OR "molar third" OR "wisdom teeth" or "wisdom tooth" OR "third-molar\*" or "3rd molar\*") AND (impact\* or unerupt\*) AND ("Tooth extraction" or extract\* or remov\* or asymptom\* or "trouble free" or trouble-free or "symptom free"))

### Appendix 3. The Cochrane Central Register of Controlled Trials (CENTRAL) search strategy

- #1 MeSH descriptor Molar, Third this term only
- #2 ("third molar\*" in All Text or "wisdom tooth" in All Text or "wisdom teeth" in All Text or "3rd molar\*" in All Text or third-molar in All Text)
- #3 MeSH descriptor tooth, impacted this term only
- #4 ((tooth in All Text near/5 impact\* in All Text) or (teeth in All Text near/5 impact\* in All Text))
- #5 MeSH descriptor Tooth, unerupted this term only
- #6 unerupt\* in All Text
- #7 ((#1 or #2) and (#3 or #4 or #5 or #6))
- #8 MeSH descriptor Tooth extraction this term only
- #9 (extract\* in All Text or remov\* in All Text)
- #10 asymptom\* in All Text
- #11 (symptomless in All Text or symptom-free in All Text or "symptom free" in All Text)
- #12 ("trouble free" in All Text or trouble-free in All Text)
- #13 (#8 or #9 or #10 or #11 or #12)
- #14 (#7 and #13)

### Appendix 4. EMBASE via OVID search strategy

- 1. Molar tooth/
  - 2. ("third molar\$" or "wisdom tooth" or "wisdom teeth" or "3rd molar\$" or third-molar\$.mp.
  - 3. ((tooth adj5 impact\$) or (teeth adj5 impact\$)).mp
  - 4. unerupt\$.mp.
  - 5. ((1 or 2) and (3 or 4))
  - 6. Tooth extraction/
  - 7. (extract\$ or remov\$).mp.
  - 8. asymptom\$.mp.
  - 9. (symptomless or symptom-free or "symptom free").mp.
  - 10. (trouble-free or "trouble free").mp.
  - 11. or/6-10
  - 12. 5 and 11
- The above subject search was linked to the Cochrane Oral Health Group filter for EMBASE via OVID:
- 1. random\$.ti,ab.
  - 2. factorial\$.ti,ab.
  - 3. (crossover\$ or cross over\$ or cross-over\$).ti,ab.
  - 4. placebo\$.ti,ab.
  - 5. (doubl\$ adj blind\$).ti,ab.
  - 6. (singl\$ adj blind\$).ti,ab.
  - 7. assign\$.ti,ab.
  - 8. allocat\$.ti,ab.
  - 9. volunteer\$.ti,ab.
  - 10. CROSSOVER PROCEDURE.sh.
  - 11. DOUBLE-BLIND PROCEDURE.sh.
  - 12. RANDOMIZED CONTROLLED TRIAL.sh.
  - 13. SINGLE BLIND PROCEDURE.sh.
  - 14. or/1-13
  - 15. ANIMAL/ or NONHUMAN/ or ANIMAL EXPERIMENT/
  - 16. HUMAN/
  - 17. 16 and 15
  - 18. 15 not 17
  - 19. 14 not 18

## WHAT'S NEW

Last assessed as up-to-date: 30 March 2012.

Date	Event	Description
14 May 2012	New search has been performed	New search. Title changed to surgical removal versus retention for the management of asymptomatic impacted wisdom teeth
14 May 2012	New citation required and conclusions have changed	Due to changes in methodology one previously included study has been deleted. Conclusion changed to insufficient evidence to determine effects of prophylactic extraction of asymptomatic wisdom teeth

## HISTORY

Protocol first published: Issue 1, 2002

Review first published: Issue 2, 2005

## CONTRIBUTIONS OF AUTHORS

Writing the protocol: Dirk Mettes, Alphons Plasschaert.

Literature search update and study selection: Dirk Mettes, Marloes Nienhuijs, Hossein Ghaemina, John Perry, Wil van der Sanden, Alphons Plasschaert.

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Editing the review: Dirk Mettes, Marloes Nienhuijs, John Perry, Wil van der Sanden, Hossein Ghaemina, Alphons Plasschaert.

## DECLARATIONS OF INTEREST

The participating authors declare that they have no financial conflict of interest, nor do they have any associations with industry regarding the subject of this review.

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- British Society of Paediatric Dentistry (BSPD), UK.

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- New York University (NYU), USA.

NYU have provided funding for the Cochrane Oral Health Group Global Alliance ([www.ohg.cochrane.org](http://www.ohg.cochrane.org)).

## DIFFERENCES BETWEEN PROTOCOL AND REVIEW

In the original written protocol the intention was to include only studies on adult participants (over 17 years of age). However, no suitable trials were identified. It was therefore decided to expand the remit to include studies on adolescent participants. The justification for this was two-fold:

- most people having their wisdom teeth removed are young adults; there is not much clinical difference between adolescents (14 to 17 years of age) and young adults (18 to 25 years of age);
- the existing clinical practice of prophylactic removal of impacted third molars following orthodontic therapy to prevent late incisor crowding.

## INDEX TERMS

### Medical Subject Headings (MeSH)

Molar, Third [\*surgery]; Randomized Controlled Trials as Topic; Tooth Extraction [\*methods]; Tooth, Impacted [\*surgery]

### MeSH check words

Adolescent; Adult; Humans